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TRANSMITTAL LETTER (General - Patent Pending)	Docket No. DP-301244

In re Application Of: **Richard W. Duce, et al.**

Serial No.	Filing Date	Examiner	Group Art Unit
10/089,260	October 7, 2002	M. Cygan	2855

Title: **A GAS SENSOR TERMINAL ASSEMBLY AND METHODS OF PRODUCING THE SAME**

TO THE COMMISSIONER FOR PATENTS:

Transmitted herewith is:

Response to One Month Action in the form of an Amended Appeal Brief Pursuant to 37 CFR 1.192 (d) (in triplicate)(39 pages)

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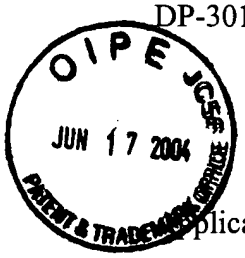
DP-301244



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Richard W. Duce, et al.	)	
		)	Group Art Unit: 2855
Serial No.:	10/089,260	)	
		)	
Filed:	October 7, 2002	)	
		)	Examiner: Michael T. Cygan
For:	A GAS SENSOR TERMINAL ASSEMBLY AND METHODS OF PRODUCING THE SAME	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

AMENDED APPEAL BRIEF
PURSUANT TO 37 CFR 1.192 (d)

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Delphi Technologies, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, Appellants' legal representatives, or Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 1-22 are pending in the application. Claims 21-22 have been withdrawn from consideration, and Claims 1-20 stand finally rejected. Claims 1-20, as they currently stand, are set forth in Appendix A. Appellants hereby appeal the rejection of Claims 1-20.

IV. STATUS OF THE AMENDMENTS

Claim 13 was amended in an amendment after Final Rejection. The amendment has been entered.

V. SUMMARY OF THE PRESENT APPLICATION

Gas sensors are electrically connected to the vehicle electrical system through the sensor body and wiring harness. Within the sensor is a sensing element used for sensing exhaust gases. Contact pads are disposed on the exterior of the sensing element to provide for electrical communication between the sensing element and the vehicle electrical system. Edge card connectors or terminals are generally used to make contact with the sensing element via the contact pads. A typical sensor utilizes a spring clip to hold an adaptor comprising male and female terminals within the sensor. A glass support and a wedge ring are disposed between the upper insulator and a glass seal. A protective shield surrounds the lower portion of the wiring harness assembly. In conventional designs, the terminals also support the weight of the sensing element and position the sensing element within the sensor. At the same time, the weight from the internal components of the wiring harness is also transferred to the terminals. Generally, the sensing element and terminals have problems with handling the weight of the wiring harness and the sensing element, as well as maintaining the position of the sensing element within the sensor.

The fragile elements have a tendency to break under the weight of the terminals and by movement within the sensor during the manufacture, testing, and operation of these conventional sensors.

The present application is directed to a gas sensor and methods of making the gas sensor, wherein terminals, terminals supports, and insulators of the gas sensor both support and protect the sensing element from movement within the sensor and help to support the weight of the wiring harness.

In one embodiment, the gas sensor comprises a sensing element, having a lower portion disposed within a subassembly and an upper portion disposed within a wiring harness assembly comprising an upper shield disposed around a wiring harness. A terminal support comprising a channel having an indentation is disposed within the wiring harness. Advantageously, terminals of the sensor are allowed to flex and distribute vibration and shock loads to the terminal support.

In another embodiment, the gas sensor comprises a sensing element, having a lower portion disposed within a subassembly and an upper portion disposed within a wiring harness assembly comprising an upper shield disposed around a wiring harness. A one-piece seal has a body disposed in a first portion of the upper shield and a flange, wherein an edge of the upper shield is disposed between at least a portion of the flange and the body. This one-piece seal provides dampening, structural integrity, and protects the sensing element by preventing the intrusion of water or other contaminants from entering the sensor. Advantageously, during use, namely exposure to high temperatures, the flange of the seal shrinks into the upper shield providing added protection for the sensor against exposure to contaminants.

As noted above, the combination of, for example, the terminal support, first insulator and terminals, protect the sensing element from exposure to the weight of the terminals, movement within the sensor, as well as the effects of vibrations. As a result, the sensor life is extended. For example, while conventional sensors typically degrade, the present sensor can withstand vibration testing (e.g., 90 hours at about 950°C and 200 - 400 hertz, with an acceleration of 22G). In another test where many conventional sensors failed in about 100 hours (e.g., the sensor element breaks and/or the terminal connectors move creating unacceptable resistance), the present sensor withstood 2,000 hours of durability testing on an engine dynamometer (equivalent to about 150,000 miles on a car).

In other words, the terminal support disclose herein advantageously allows the terminals to flex and distribute vibration and shock loads to the terminal support, thereby extending the life of the sensor. Furthermore, the one-piece seal disclosed herein also may be employed to extend the life of the sensor. More particularly, as noted above, during use the flange of the one-piece seal shrinks into the upper shield of the sensor to provide added protection for the sensor against exposure to contaminants.

VI. ISSUES

1. WHETHER CLAIMS 13, 16, AND 17 ARE ANTICIPATED UNDER 35 U.S.C. 102(b) BY U.S. PATENT NO. 5,329,806 TO MCCLANAHAN ET AL.?

2. WHETHER CLAIMS 1-13 AND 16-20 ARE OBVIOUS UNDER 35 U.S.C. §103(a) OVER U.S. PATENT NO. 5,817,920 TO KUISELL ET AL. IN VIEW OF U.S. PATENT NO. 5,329,806 TO MCCLANAHAN ET AL.?

3. WHETHER CLAIMS 14 AND 15 ARE OBVIOUS UNDER 35 U.S.C. §103(a) OVER U.S. PATENT NO. 5,817,920 TO KUISELL ET AL. IN VIEW OF U.S. PATENT NO. 5,329,806 TO MCCLANAHAN ET AL. AND FURTHER IN VIEW OF U.S. PATENT NO. 5,948,963 TO KATO ET AL.?

VII. GROUPING OF THE CLAIMS

With reference to the appealed claims, the claims do not stand together. More particularly, Claims 1-12 are grouped together and are directed to a gas sensor and a method of making the gas sensor, wherein the gas sensor comprises, *inter alia*, a terminal support disposed within a wiring harness, wherein the terminal support comprises a channel extending therethrough, the channel comprises an indentation. Claims 13-20 are grouped together and are directed to a gas sensor comprising, *inter alia*, a one-piece seal having a body disposed in a first portion of an upper shield and a flange, wherein an edge of the upper shield is disposed between at least a portion of the flange and the body.

VIII. ARGUMENT

1. Claims 13, 16, and 17 are not anticipated by McClanahan et al.

In making the rejection, the Examiner stated,

> McClanahan discloses the claimed invention, an oxygen sensor having sensing element [40], subassembly [34], upper shield [68], terminal support [64], and ceramic insulator [44] having passageway for receiving terminals [52], and **a seal** having a hinge portion designed to lock with an edge of the upper shield.

(Final O.A., page 4, emphasis added).

However, McClanahan et al. fail to teach a **one-piece** seal as claimed by Applicants. Rather, McClanahan et al. teach an oxygen sensor including an upper shield, a body, a lower shield, and a cap all connected together to form the oxygen sensor housing. (Col. 2, lines 61-64). A plug or seal may be inserted into the oxygen sensor cap. (Col. 3, lines 24-26). The cap may include a first resilient lock for releasably locking onto a ridge formed on an upper portion of the body of the sensor. The first resilient lock may be an inwardly extending lip or a resilient finger at the lower edge of the cap. (Col. 3, lines 46-50).

In other words, McClanahan et al. teach the use of two components, i.e., a plug/seal and a cap. This configuration is sometimes referred to in the art as a seal and a boot. The seal fits within the cap and does not comprise, e.g., a flange. Since McClanahan et al. teach two components, they do not teach a one-piece seal as claimed by Applicants. As such, McClanahan et al. do not teach each and every element of Applicants' independent Claim 13. Since they do not teach each and every element of Applicants' claimed invention, McClanahan et al. do not anticipate Claim 13. Moreover, as a dependent claim from an allowable independent claim, Claims 16 and 17 are, by definition, also allowable.

2. Claims 1-13 and 16-20 are non-obvious over Kuisell et al. in view of McClanahan et al.

In making the rejection, the Examiner stated that "Kuisell teaches the claimed invention except for the claimed seal structure **and** an indented channel in the terminal support, **and** the use of ceramic fibers as the insulator." (Final O.A., page 5; emphasis added). The Examiner relied upon McClanahan et al. for teaching Appellants' seal structure, indented channel in the terminal support, and the use of ceramic fibers as the insulator. More particularly, the Examiner stated that:

> It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the alternative seal design and alternative terminal support structure of McClanahan in the sensor of Kuisell to obtain the seal fixing advantages stated by McClanahan (column 1, lines 41-54), and to obtain the advantage of fixing or restricting the location of the terminal in the support.

(Final O.A., page 5).

Appellants respectfully disagree that one of skill in the art would have been motivated to modify the teachings of these references as suggested by the Examiner. More particularly, each reference is directed to a different sensor design than the other reference. In order to combine the references as suggested by the Examiner, one of skill in the art would have to disregard the particular designs taught in each reference (no motivation), substitute only the plug portion (64) of McClanahan et al. for the terminal adapter (72) of Kuisell et al. (no motivation), redesign the shell of Kuisell et al. (no motivation), and redesign the terminal connections (no motivation). In other words, the Examiner appears to be using impermissible hindsight to pick and choose pieces of these references to attempt to construct the present claims. The cited references, either alone or in combination, would not have lead one of skill in the art to make Appellants' claimed invention.

For example, the Examiner relied upon Kuisell et al. for teaching "an oxygen sensor comprising sensing element [44], subassembly [50], upper shield [63], ceramic terminal support [72], and an alumina insulator [62] having passageway for receiving terminals [66, 68]...." (Final O.A., page 5). As noted above, however, Kuisell et al. do not teach or suggest an indented channel in the terminal support. Rather, the Examiner relied upon McClanahan et al. for teaching an indented channel in a terminal support. More particularly, McClanahan et al. teach an oxygen sensor including an upper shield (32), a body (34), a lower shield (32), and a cap (38) all connected together to form the oxygen sensor housing. (Col. 2, lines 61-64). It is further noted that a plug (64) or seal may be inserted into the oxygen sensor cap (38). (Col. 3, lines 24-26). The cap (38) may include a first resilient lock for releasably locking onto a ridge formed on an upper portion of the body of the sensor. The first resilient lock may be an inwardly extending lip or a resilient finger at the lower edge of the cap. (Col. 3, lines 46-50).

As briefly mentioned above, one of skill in the art would at least have to modify Kuisell et al. first redesigning the shell and terminal connections of Kuisell et al. and then substitute the plug (64) of McClanahan et al. for the terminal adapter [72] of Kuisell et al. in order to make Appellants' claimed invention. Absent in the above cited references is any suggestion to modify

the teachings of Kuisell et al. such that the plug (64) and cap (38) can be used in the sensor of Kuisell et al. For at least these reasons, the above cited references fail to teach or suggest, *inter alia*, "a sensing element, having a lower portion disposed within a subassembly and an upper portion disposed within a wiring harness assembly comprising an upper shield disposed around a wiring harness"; and "a terminal support disposed within said wiring harness, wherein said terminal support comprising a channel extending therethrough, said channel comprising an indentation."

Furthermore, with regard to independent Claim 13, as briefly mentioned above, McClanahan et al. fail to teach or suggest a one-piece seal. Rather, McClanahan et al. teach that a plug or seal may be inserted into the oxygen sensor cap. (Col. 3, lines 24-26). In other words, McClanahan et al. teach the use of two components, i.e., a plug/seal and a cap. This configuration is sometimes referred to in the art as a seal and a boot.

Absent in McClanahan et al. is any motivation or suggestion to make a "one-piece" seal having a body disposed in a first portion of said upper shield and a flange, wherein an edge of said upper shield is disposed between at least a portion of said flange and said body. Rather, in responding to Appellants' previously submitted arguments in regard to this rejection, the Examiner relied upon case law for the motivation to modify the teachings of the two-piece seal of McClanahan et al. More particularly, the Examiner stated:

> [i]t has been held that forming in one piece an article which has formerly been formed in two pieces and put together involves only routine skill in the art. [Cite omitted].

(Final O.A., page 7).

While it is accepted that a one-piece construction may be an obvious design choice, it is equally well accepted that a one-piece construction may be patentable. See *Schenckv. Norton Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983) (Claims were directed to a vibratory testing machine (a hard-bearing wheel balancer) comprising a holding structure, a base structure, and a supporting means which form "a single integral and gaplessly continuous piece." Norton argued that the invention is just making integral what had been made in four bolted pieces. The court found this argument unpersuasive and held that the claims were patentable because the prior art perceived a need for mechanisms to dampen resonance, whereas the inventor eliminated the need for dampening via the one-piece gapless support structure, showing insight that was contrary to the understandings and expectations of the art.); MPEP 2144.04.

Advantageously, Appellants teach that "during use, namely exposure to high temperatures, the flange of seal 40 shrinks into the upper shield providing added protection for the sensor 10 against exposure to contaminants." (Page 6, lines 1-4). This is a problem that conventional seal designs failed to solve. Actually, this issue has been addressed by the addition of a second component, e.g., a cap, which is sometimes referred to as a boot. However, it is noted that no one prior to Appellants have taught or suggested a one-piece seal having a flange. For at least these reasons, Appellants respectfully submit that independent Claims 1, 7, and 13 have improperly been rejected. As such, these claims are non-obvious over the above cited art and are therefore allowable. Moreover, as dependent claims from allowable independent claims, Claims 2-6, 8-12, and 14-20 are, by definition, also allowable.

3. Claims 14 and 15 are non-obvious over Kuisell et al. in view of McClanahan et al. in further view of Kato et al.

Kato et al. teach a gas sensor comprising "a sensor element for measuring a predetermined gas component contained in an introduced measurement gas, and a protective cover arranged to surround a forward end of the sensor element". (Abstract). Additionally, Kato et al. teach the use of a ceramic powder, such as, talc between ceramic supports. (Col. 10, lines 57-60).

In making this rejection, the Examiner relied upon Kato et al. merely for teaching the use of a talc pack. However, Kato et al. fail to cure the deficiencies of the above-cited references. More particularly, Kato et al. fail to teach or suggest, *inter alia*, "a one-piece seal, said seal having a body disposed in a first portion of said upper shield, and a flange wherein an edge of said upper shield is disposed between at least a portion of said flange and said body". Furthermore, even if combined, the above-cited references fail to teach a sensor having a one-piece seal as claimed by Appellants' in independent Claim 13. Since the combined references fail to teach or suggest, each and every element of Applicants independent Claim 13, the Examiner has not made a *prima facie* case of obviousness. Moreover, even if the Examiner has made a *prima facie* case of obviousness, Appellants respectfully direct the Board's attention to the numerous advantageous discussed above with regard to the one-piece seal. Accordingly, Appellants' independent Claim 13 is not obvious over the above cited art and is therefore

allowable for at least the reasons set forth above. As dependent claims from an allowable independent claim, Claims 14-15, are, by definition, also allowable.

IX. CONCLUSION

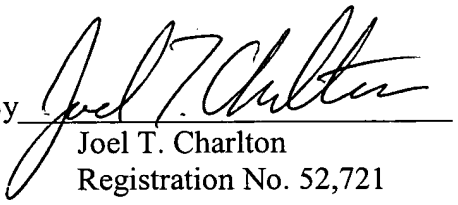
In summary, Claims 1-20 are not anticipated by and are non-obvious over the art of record. For the reasons cited above, Appellants respectfully submit that all of the claims are allowable and the application is in condition for allowance. Appellants respectfully request reversal of the outstanding rejections and allowance of this application.

In the event the Examiner has any queries regarding the submitted arguments, the undersigned respectfully requests the courtesy of a telephone conference to discuss any matters in need of attention.

If there are any additional charges with respect to this Appeal Brief, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

CANTOR COLBURN LLP

By 
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APPENDIX A
CLAIMS

1. (Previously Presented) A gas sensor, comprising:

a sensing element, having a lower portion disposed within a subassembly and an upper portion disposed within a wiring harness assembly comprising an upper shield disposed around a wiring harness;

a terminal support disposed within said wiring harness, wherein said terminal support comprising a channel extending therethrough, said channel comprising an indentation;

a first portion of a terminal disposed within said indentation of said terminal support and in electrical communication with said sensing element; and

an insulator at least partially disposed within said upper shield and around said sensing element upper portion, said insulator having a passage for receiving a second portion of said terminal.

2. (Previously Presented) The gas sensor of Claim 1, wherein said insulator is a material selected from the group consisting of a ceramic, metal, and combinations, alloys, and composites comprising at least one of the foregoing materials.

3. (Previously Presented) The gas sensor of Claim 2, wherein said ceramic is selected from the group consisting of steatite, alumina, and combinations comprising at least one of the foregoing ceramics.

4. (Previously Presented) The gas sensor of Claim 2, wherein said insulator is in a form selected from the group consisting of random fibers, chopped fibers, continuous fibers, woven fibers, woven mesh, non-woven mesh, and combinations comprising at least one of the foregoing forms.

5. (Previously Presented) The gas sensor of Claim 1, wherein said terminal support is a material selected from the group consisting of thermoplastic, thermoset, ceramic, and combinations comprising at least one of the foregoing materials.

6. (Previously Presented) The gas sensor of Claim 5, wherein said ceramic is selected from the group consisting of steatite, alumina, among others and combinations comprising at least one of the foregoing ceramic materials.

7. (Previously Presented) A method of producing a gas sensor, comprising:

disposing an upper portion of a sensing element within a wiring harness assembly comprising an upper shield disposed around a wiring harness; disposing a lower portion of said sensing element within a subassembly;

disposing a terminal support within said wiring harness, wherein said terminal support comprising a channel extending therethrough, said channel comprising an indentation;

disposing a first portion of a terminal within said indentation of said terminal support and disposing in electrical communication with said sensing element; and

disposing an insulator at least partially within said upper shield and around said sensing element upper portion, said insulator having a passage for receiving a second portion of said terminal.

8. (Previously Presented) The method of Claim 7, wherein said insulator is a material selected from the group consisting of a ceramic, metal, and combinations, alloys, and composites comprising at least one of the foregoing materials.

9. (Previously Presented) The method of Claim 8, wherein said ceramic is selected from the group consisting of steatite, alumina, and combinations comprising at least one of the foregoing ceramics.

10. (Previously Presented) The method of Claim 8, wherein said insulator is in a form selected from the group consisting of random fibers, chopped fibers, continuous fibers, woven fibers, woven mesh, non-woven mesh, and combinations comprising at least one of the foregoing forms.

11. (Previously Presented) The method of Claim 7, wherein said terminal support is a material selected from the group consisting of thermoplastic, thermoset, ceramic, and combinations comprising at least one of the foregoing materials.

12. (Original) The method of Claim 11, wherein said ceramic is selected from the group consisting of steatite, alumina, among others and combinations comprising at least one of the foregoing ceramic materials.

13. (Previously Presented) A gas sensor, comprising:

a sensing element, having a lower portion disposed within a subassembly and an upper portion disposed within a wiring harness assembly comprising an upper shield disposed around a wiring harness;

a one-piece seal, said seal having a body disposed in a first portion of said upper shield and a flange, wherein an edge of said upper shield is disposed between at least a portion of said flange and said body;

a shell disposed around said lower portion of said sensing element;

a first insulator, wherein at least a portion of said first insulator is disposed between said sensing element and said shell;

a lower shield disposed around an end of said sensing element, said lower shield in physical contact with said shell, and having a plurality of apertures;

at least one terminal in electrical communication with said sensing element; and

a terminal support in physical contact with said terminal.

14. (Previously Presented) The gas sensor of Claim 13, wherein said subassembly further comprises a talc pack disposed within said shell between said first insulator and said lower shield.

15. (Previously Presented) The gas sensor of Claim 14, wherein said subassembly further comprises a second insulator disposed within said shell between said talc pack and said lower shield.

16. (Previously Presented) The gas sensor of Claim 13, wherein said first insulator is a material selected from the group consisting of a ceramic, metal, and combinations, alloys, and composites comprising at least one of the foregoing materials.

17. (Previously Presented) The gas sensor of Claim 16, wherein said ceramic is selected from the group consisting of steatite, alumina, and combinations comprising at least one of the foregoing ceramics.

18. (Previously Presented) The gas sensor of Claim 16, wherein said first insulator is in a form selected from the group consisting of random fibers, chopped fibers, continuous fibers, woven fibers, woven mesh, non-woven mesh, and combinations comprising at least one of the foregoing forms.

19. (Previously Presented) The gas sensor of Claim 13, wherein said terminal support is a material selected from the group consisting of thermoplastic, thermoset, ceramic, and combinations comprising at least one of the foregoing materials.

20. (Previously Presented) The gas sensor of Claim 19, wherein said ceramic is selected from the group consisting of steatite, alumina, among others and combinations comprising at least one of the foregoing ceramic materials.